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SIMTEK6469

IN THE UNITED STATES PATENT OFFICE

In re Application
Hideaki Takahashi

App. No.: 10/065312
Filed: October 2, 2002
Cont. No.: 7690
Title: PERMANENT MAGNET TYPE ROTARY ELECTRIC MACHINE

Examiner: Y. Comas
Art Unit: 2834
Commissioner for Patents
P.O. Box 1450
Arlington, VA 22313-1450

I hereby certify that this correspondence and all marked attachments are being deposited with the United States Patent Office via fax to (703) 872-9319 on:
December 3, 2004
Ernest A. Beutler
Reg. No. 19901

Dear Sir:

SUBSTITUTE APPELLANT'S BRIEF

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences the outcome of which would have a bearing on this appeal or which would be affected by the decision in this appeal.

REAL PARTY IN INTEREST

In addition to the appellant, the real party in interest is his assignee, Kabushiki Kaisha Moric, a Japanese company.

STATUS OF CLAIMS

This case was previously briefed in a brief filed June 8, 2004. In response to that Brief the Examiner reopened prosecution and issued new rejections based on new references. In doing so he entered a proposed amendment suggested in the earlier brief by canceling claim 10 and correcting the dependency of claim 11 to depend on claim 9 rather than cancelled claim 10. Applicant has chosen to submit this new brief rather than proposing another amendment.

Claims 1, 3–9, 12 and 14-19 remain in this application. Although the Examiner has indicated in the Final Rejection that claims 15-19 would be allowable if rewritten in independent form, they were so rewritten when the Final Rejection was issued. However the Examiner has now rejected independent claim 15, but has again indicated the allowability of claims 16-19. Thus only claims 1, 3-9,12, 14 and 15 are before the Board on appeal. A clean copy of the claims on appeal appears in the Appendix to this Brief.

STATUS OF AMENDMENTS

As noted above, an amendment proposed in appellant's earlier brief has been made by the Examiner, but no further amendment is or was proposed.

APPELLANT'S INVENTION

Appellant's invention before the Board relates to a rotating electrical machine and particularly to one that includes a second electrical machine that is selectively operated when desired to cancel out the cogging torque of the primary machine only at desired times.

As is noted in the specification, rotating electrical machines may experience a condition known as "cogging". It has been well known that the periodic variation in the output torque of a brushless DC motor using permanent magnets due to a condition referred to as "cogging torque". This cogging torque is generated by the attractive or repulsive force between the permanent magnets and the magnetic poles or teeth on which the windings are formed. The period of this cogging torque is determined by the least common multiple of the number of permanent magnet poles and the number of slots formed between the teeth. Although various methods have been proposed for reducing or eliminating cogging torque, those have either been used or not used as the application demands. That is even though there may only be some instances when the cogging torque is a problem, all previous solutions as well as certain embodiments of this application have either always used a second device to cancel out the cogging torque at all times or have not attempted to cancel it out at all.

Thus the only embodiments of the application before the Board on this appeal are the electrically operated ones of FIGS. 5-7 and 8-10 and a single claims to the mechanically operated embodiment of FIGS. 11-13. The remaining mechanically operated device recited in claims 16-19 have been allowed and thus are not before the Board.

The embodiments before the Board (FIGS. 5-7 and 8-10 and mechanically embodiment of claim 15) embody either smaller motors that are operated under low load and speed conditions where the cogging presents an objectionable situation but are switched off to conserve power when they are not needed and the cogging does not present a problem or in the mechanical embodiment a mechanical device that selectively generates a canceling torque. The electrically operated embodiments are described in detail by reference to the noted figures under the appropriate heading at paragraphs 0033-0038 and 0039-0042, respectively. The mechanically operated embodiment of claim 15 is described in paragraphs 0043-0047.

ISSUES BEFORE THE BOARD

The issue before the Board is whether the subject matter of claims 1, 3-12, 14 and 15 is obvious under 35 USC 103(a) from the teachings of EP0447257A2 (Satake et al) in view of a secondary reference indicated by the Examiner as US Reissue Patent Re 29,775 which is referred to by the Examiner as "Nashiki". However the patentee of that reissue is Helmer and from the Examiner's comments he meant to rely on 6,211,593 (Nashiki) and that reference will be dealt with in this brief.

GROUPING OF THE CLAIMS

The following claim groupings stand or fall together.

Claims 1 and 4.

The patentability of the remaining claims and this group are argued separately.

APPELLANT'S ARGUMENTS

Unlike the one presented in the Examiner's earlier rejection that was previously briefed, it is believed that the issues before the Board here are relatively straight forward because neither of the relied upon references deal with the problem solved by applicant's invention that being the selective reduction in cogging torque under only those operating situations where it is objectionable.

All embodiments of claimed clearly require two separate devices each having its own pair of relatively rotatable elements one of which devices is selectively operated to cancel the cogging torque of the other device. At the outset the Board's attention is directed to the fact that neither reference relied upon by the Examiner mentions or describes cogging torque. The word "cogging" or any equivalent of it does not appear in either reference.

Thus it is submitted that the Examiner is not combining references dealing with the problem addressed by appellant. Thus, at best, the combination proposed is an obvious attempt to construct the claimed invention from bits and pieces of the prior art utilizing appellants invention not the teaching of the prior art.

Thus the Board must decide if that combination is taught from the cited art, but apart from appellant's teaching. It is most respectfully submitted that the art cited itself does not teach the combination because neither reference relied on by the Examiner refers to a situation where cogging may be a problem only under some operating conditions and thus it may be necessary to apply the cogging reduction under those conditions. It is submitted that lacking such a teaching to support the combination, the rejection can not be sustained as obvious.

In addition to this important functional distinction, there are related, important structural differences from the cited art. Both independent claims 1 and 15 call for two devices each having a pair of relatively rotatable elements and one of which is selectively operable. All embodiments of Satake and Nashiki have a common have a common shaft and the two devices all operate together. In each reference the devices operate together at all times and neither is selectively operable but the effect of their operations may change automatically as a result of the simultaneous changed operating speeds of both devices.

Turning now to selective analysis of the claims and first to independent claim 1, it specifically calls for a device having a plurality of circumferentially spaced permanent magnets that cooperate with radially extending pole teeth around which coils are wound and a "selectively operable device for selectively generating a cogging torque out of phase with and substantially canceling that of said primary assembly". Since neither reference mentions cogging torque nor has a "selectively operable" assembly it is submitted that not only has the Examiner failed to make out a prima facia case, but rather has demonstrated the inventiveness of this concept and the structures that accomplish it.

Claim 3 depends on claim 1 and further states that the cogging canceling device "is operated" only at low speeds. The Satake device is operated at all times but is effective only at lower speeds. Again its purpose is not to reduce cogging, but to assist in the starting of a synchronous motor, quite a different purpose.

Claim 4 stands or falls with claim 1 upon which it depends.

Claim 5 depends on claim 4, but does not stand or fall with it. This claim adds the recitation of how the cogging torque of the canceling device is established. Again the Board's attention is directed to the fact that neither reference mentions cogging torque nor has the Examiner established that it is inherent in either or both references.

Claim 6 depends on claim 5 and further recites that the two devices have the same construction but are out of phase with each other. Again this is not true with either reference even though the Examiner makes this unsupported allegation.

Claim 7 depends on claim 6 and further defines a specific phase difference and this is not even discussed in the rejection, an admission that the references do not respond to the claim language either alone or in combination.

Claim 8 depends on claim 5 and relates the number of magnetic pole teeth of the canceling device to the number of coggings of the primary device. Again this is not even discussed in the rejection, an admission that the references do not respond to the claim language either alone or in combination.

Claim 9 depends on claim 8 and requires the magnetic pole teeth of the canceling device to be equally spaced. Again this is not even discussed in the rejection, an admission that the references do not respond to the claim language either alone or in combination.

Claim 11 depends on claim 9 and recites that the selective canceling operation is done by controlling the current in the windings of the canceling device. The Examiner alleges that this is the case with his art but does not point out where it is shown, because it is not disclosed in the cited art.

Claim 12 depends on claim 8 and recites other details of the construction not addressed by the Examiner, another demonstration of the error in his position.

Claim 14 recites the same feature as claim 11, but does not stand or fall with it because of the difference in its dependency. Also this claim does not stand or fall with claim 4 upon which it depends, because of this added distinguishing feature.

Turning now to independent claim 15, which was previously allowed by the Examiner, he now rejects it on the same basis as claim 1. However this claim calls for the cogging cancellation to be established mechanically. This is not shown by the art relied upon.

Thus it is most respectfully submitted that the Examiner has failed to make out a prima facia case of obviousness and is combining the references in an effort to anticipate appellants invention not on the basis of the prior art teaching but on appellant's own disclosure. Reversal of the Rejection is, therefore most respectfully requested.

No fee is required as the Brief Fee has already been paid once

Respectfully submitted:

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APPENDIX
CLEAN COPY OF CLAIMS ON APPEAL

1. A rotating electrical machine comprised of a primary device having a pair of relatively rotatable assemblies consisting of one assembly comprised of a plurality of circumferentially spaced permanent magnets of alternating polarity, the other of said assemblies being comprised of a plurality of radially extending, magnetic poles having ends cooperating with said permanent magnets and surrounded by coil windings and defining slots therebetween, relative rotation of said assemblies generating a cogging torque determined by the least common multiple of the number of said magnets and the number of said slots, and a selectively operable cogging torque canceling device for selectively generating a canceling cogging torque out of phase with and substantially canceling that of said primary assembly, said cogging torque canceling device having a second pair of relatively rotatable assemblies.

3. A rotating electrical machine as set forth in claim 1, wherein the cogging torque canceling device is operated only at lower speeds of relative rotation of the primary device.

4. A rotating electrical machine as set forth in claim 1, wherein the cogging torque canceling device generates the canceling cogging torque electrically.

5. A rotating electrical machine as set forth in claim 4, wherein the second pair of relatively rotatable assemblies of the cogging torque canceling device is comprised of one assembly comprised of a plurality of circumferentially spaced permanent magnets of alternating polarity, the other of said assemblies of said cogging torque canceling device being comprised of a plurality of radially extending, magnetic pole teeth having ends cooperating with said permanent magnets and surrounded by coil windings and defining slots therebetween, relative rotation of said second pair of relatively rotatable assemblies generating a canceling cogging torque determined by the least common multiple of the number of said magnets and the number of said slots.

6. A rotating electrical machine as set forth in claim 5, wherein the first and second pair of relatively rotatable assemblies have substantially the same construction and are out of phase with each other.

7. A rotating electrical machine as set forth in claim 6, wherein the phase difference between the first and second pair of relatively rotatable assemblies is equal to one half of the mechanical rotational angle of a single phase of the cogging torque of the first relatively rotatable assembly.

8. A rotating electrical machine as set forth in claim 5, wherein the number of magnetic pole teeth of the second pair of relatively rotatable assemblies is equal to the coggings of the first pair of relatively rotatable assemblies during a single rotation thereof.

9. A rotating electrical machine as set forth in claim 8, wherein the magnetic pole teeth of the second pair of relatively rotatable assemblies are equally spaced.

11. A rotating electrical machine as set forth in claim 9, wherein the selective operation of the cogging torque canceling device is achieved by controlling current in the coil windings of the second pair of relatively rotatable assemblies.

12. A rotating electrical machine as set forth in claim 8, wherein the magnetic pole teeth of the second pair of relatively rotatable assemblies are formed by two sets of rings each having the same number of magnetic pole teeth as the first pair of relatively rotatable assemblies with the pole teeth thereof equally spaced and slightly offset from each other in a circumferential direction.

14. A rotating electrical machine as set forth in claim 4, wherein the selective operation of the cogging torque canceling device is achieved by controlling current in the coil windings of the second pair of relatively rotatable assemblies.

15. A rotating electrical machine comprised of a primary device having a pair of relatively rotatable assemblies consisting of one assembly comprised of a plurality of circumferentially spaced permanent magnets of alternating polarity, the other of said assemblies being comprised of a plurality of radially extending, magnetic poles having ends cooperating with said permanent magnets and surrounded by coil windings and defining slots therebetween, relative rotation of said assemblies generating a cogging torque determined by the least common multiple of the number of said magnets and the number of said slots, and a mechanically operated cogging torque canceling device for selectively generating a canceling cogging torque out of phase with and substantially canceling that of said primary assembly, said cogging torque canceling device having a second pair of relatively rotatable assemblies.